



Critical transitions and the effects of timing in biogeomorphic ecosystems

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Vegetation interacts with fluvial, coastal and aeolian sediment transport through disturbance and biogeomorphic feedback mechanisms. Feedback mechanisms, for example through erosion protection in vegetated areas, lead to self-organized landscapes whereas shifts between vegetation cover and bare substrate often occur as sudden critical transitions. This means, from an ecosystem point of view, that under the same conditions both vegetated and bare state can co-exist. Recovery of the vegetated state after disturbance requires a prolonged period of favourable conditions which is quantifiable using the Window of Opportunity (WoO) concept.

Understanding time sensitive interactions between plant biology and geomorphology is key to predict ecosystem development and landscape evolution of vegetated biogeomorphic system. Plant life history and plant traits of dune, marsh or mangrove species interact with geomorphic/hydrological forcing at various spatial and temporal scales from several days to decades. Such interactions are especially important in the light of changing phenology and weather pattern with climate change. Given the increasing interest in ecosystem service provisioning predictive tools need to be developed to effectively manage dynamic biogeomorphic landscapes.